

Princeton Center for Theoretical Science

The Princeton Center for Theoretical Science is dedicated to exploring the frontiers of theory in the natural sciences. Its purpose is to promote interaction among theorists and seed new directions in research, especially in areas cutting across traditional disciplinary boundaries.

The Center is home to a corps of Center Postdoctoral Fellows, chosen from nominations made by senior theoretical scientists around the world. A group of senior Faculty Fellows, chosen from science and engineering departments across the campus, are responsible for guiding the Center. Center activities include focused topical programs chosen from proposals by Princeton faculty across the natural sciences. The Center is located on the fourth floor of Jadwin Hall, in the heart of the campus “science neighborhood”. The Center hopes to become the focus for innovation and cross-fertilization in theoretical natural science at Princeton.

Faculty Fellows

Igor Klebanov, Director
Ned Wingreen, Associate Director
Andrei Bernevig
Duncan Haldane
Andrej Košmrlj
Frans Pretorius
Silviu Pufu
Eliot Quataert
Shinsei Ryu
Anatoly Spitkovsky

Center Postdoctoral Fellows

Jan Albert 2024-2027
Ashley Bransgrove 2023-2026
Miguel Goncalves 2024-2027
Mina Himwich 2023-2026
David Hosking 2022-2025
Jonah Kudler-Flam 2022-2025
Yves Kwan 2022-2025
Sebastian Mizera 2024-2027
Anirudh Prabhu 2022-2025
Rhine Samajdar 2022-2025
Colin Scheibner 2023-2026
Olivier Simon 2023-2026
Benjamin Sorkin 2024-2027
Pok Man Tam 2023-2026

To find out more about PCTS see: <https://pcts.princeton.edu>



New Twists of Quantum Geometry

December 4-6, 2024
Room 407, Jadwin Hall

Organizers

Duncan Haldane
Alexander Kruchkov
Biao Lian
Shinsei Ryu
Pok Man Tam

Regular talk: 35 mins (+ 10 mins Q&A)

New Twists of Quantum Geometry

Wednesday, December 4, 2024

- 8:00-9:00 Check in and Light Breakfast
8:55-9:00: Opening remarks
- 9:00-9:45 **David Vanderbilt (Rutgers)**
"Berry curvature and quantum metric in band-structure theory"
- 9:45-10:30 **Tomoki Ozawa (Tohoku U.)**
"Quantum metric: from perspectives on optical response and topology"
- 10:30-11:00 Coffee break
- 11:00-11:45 **Philip Kim (Harvard)**
"Microwave reflectometry measurement of quantum geometry in 2D materials"
- 11:45-12:30 **Alexander Kruchkov (Princeton)**
"Paradigm shift: dispersionless electrons showcase quantum-geometric transport"
- 12:30-2:00 Lunch at PCTS
- 2:00-2:45 **André Eckardt (TU Berlin)**
"A lattice model for "traid anyons" & quantum geometry of bosonic Bogoliubov quasiparticles"
- 2:45-3:30 **Duncan Haldane (Princeton)**
"Fractional Chern insulators and real-space quantum geometry of Bloch bands"
- 3:30-4:00 Coffee break
- 4:00-4:45 **Emil Bergholtz (Stockholm U.)**
"Parafermions and topological crystals in Moiré materials"
- 4:45-5:30 **Jie Wang (Temple)**
"Generalized Landau Levels: Fractionalization, Geometric Response and Lattice Realizations"
- 5:30 – 7:00 Reception for everyone at PCTS

New Twists of Quantum Geometry

Thursday, December 5, 2024

- 8:30-9:00 Light Breakfast
- 9:00-9:45 **Sebastiano Peotta (Aalto U.)**
"Superconductivity and quasiparticle localization in flat bands"
- 9:45-10:30 **Chun Ning Lau (Ohio State U.)**
"Superconductivity and Coulomb interactions in twisted bilayer graphene"
- 10:30-10:45 Coffee break
- 10:45-11:30 **Andrei Bernevig (Princeton)**
"Topological Heavy Fermion Model of TBG and Quantum Geometry"
- 11:30-12:15 **Jiabin Yu (U. Florida)**
"Quantum geometry in correlated quantum materials"
- 12:15-1:15 Lunch at PCTS
- 1:15-2:00 **Nathan Goldman (ULB Brussels and Collège de France)**
"Ode to Streda's formula: From correlated insulators to Floquet systems"
- 2:00-2:45 **Raquel Queiroz (Columbia)**
"The links between linear response and quantum geometry"
- 2:45-3:00 Coffee break
- 3:00-3:45 **Liang Fu (MIT)**
"Topological bound and quantum geometry"
- 4:00-5:00 **Physics Colloquium Room A-10, Jadwin Hall**
Raffaele Resta (CNR-IOM)
"Berry curvatures and adiabatic observables"

Regular talk: 35 mins (+ 10 mins Q&A)

New Twists of Quantum Geometry

Friday, December 6, 2024

8:30-9:00

Light Breakfast

9:00-9:45

Martin Claassen (U. Penn)

“Shining light on quantum geometry of correlated electrons”

9:45-10:30

Barry Bradlyn (UIUC)

“Density response, sum rules, and quantum geometry”

10:30-10:45

Coffee break

10:45-11:30

Anatoli Polkovnikov (Boston U.)

“Dynamics of complex systems through the prism of adiabatic transformations and geometry”

11:30-12:15

Gil Refael (Caltech)

“Quantum geometry and bounds on dissipation in slowly driven quantum systems”

12:15

Lunch at PCTS and Departure